Handheld Computer Application for Time-Motion Studies in the Emergency Department

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Abstract

Urban academic emergency departments face significant challenges of increasing patient volumes and sicker patients. Better understanding of the timing and interactions between provider activities may assist in efforts directed toward improving patient-care processes to decrease length of stay. Rapidly changing and overlapping activities in the emergency department make time-motion study difficult. This poster describes a handheld computer application that enables synchronized capture of task description and times across multiple patient care providers in the emergency department.

Background

Emergency Departments (EDs) across the country are struggling to provide timely and high quality care under an ever-increasing burden of higher volume and sicker patients, leading to what has become a nationally recognized crisis in emergency care, particularly in urban academic EDs.[1] Time-motion studies have previously been found useful in several ways in the ED, including study of task interruptions.[2] Time-motion studies of the interactions and dependencies between the activities of care providers, of great importance in the emergency department, have not been previously reported. Capture of information regarding these interactions and dependencies might be critical in efforts to improve efficiency.

Time-motion studies are often performed using paper, pencil and stop watches, but this approach has its limitations. Using stop watches to record durations does help to answer questions about what caregivers spend their time doing, but cannot provide information about the interactions of activities across care providers. Capturing starting and ending times of activities along with a description of the activity is difficult, particularly in the emergency department, due to frequently changing and sometimes overlapping tasks. For example a physician may view laboratory results on a computer during the course of a telephone discussion with a consulting physician. Whether this situation represents overlapping activities depends, in part, upon the degree of granularity with which the study is done. For the purpose of studying interactions between activities across providers, a high degree of granularity is desirable. With this requirement, paper and pencil time-motion data capture has limited usefulness, particularly in the hectic environment of the emergency department.

In addition to the activities of emergency department physicians and nurses, the activities of other care providers are also of interest, including: consulting physicians, radiology technicians, phlebotomists, ECG technicians, and respiratory therapists.

Tool Description

This tool is designed to be operated in one of three modes, to capture observations from any one of three perspectives – the ED physician, the ED nurse, and the patient. The patient observer perspective allows the capture of activities of care providers other than the ED physician and nurse as well as patient initiated activities such as pushing a call light button.

The application was developed in Satellite Forms for the Palm OS. The tool is designed with buttons and pick lists allowing categorization of activities in an easy and intuitive manner. The tool has separate forms for each perspective (physician, nurse, and patient). On each form, there are up to eight buttons for high level categorization of possible events. On the physician form, for example, button categories include "with patient", "with nurse", "with doctor", "information system", "paper chart", "in transit", "waiting", and "other". For each of these categories, there are more specific subcategories with descriptions displayed in a pick-list filtered by the category buttons. Timing of the activity begins when the button is pressed, allowing some deliberation before picking the subcategory while the activity continues.

To capture timing of overlapping activities, the tool allows simultaneous timing of two activities. The user taps a "multitasking" button before selecting the second activity. Both activities are then timed in this multitasking mode until either activity is ended by tapping one of two end buttons.

For each recorded activity, the start time, end time, duration, event category code, and patient ID are recorded. For activities recorded from ED physician or nurse perspective, a provider ID is also recorded.

References

1. Center for Studying Health System Change. Emergency Room Diversions: A Symptom of Hospitals Under Stress. Issue Brief Number 38, 2001 May.
2. Chisholm CD, Dornfeld AM, Nelson DR, Cordell WH. Work interrupted: A comparison of workplace interruptions in emergency departments and primary care offices. Annals of Emergency Medicine 2001 August; 38(2):146-151.